T08D07 – Topic 01 Review: Acid Nomenclature

Name KEY

The naming of acids is different from naming ionic or molecular compounds. Acids are molecular compounds that are dissolved in water. Essentially there are two different types of acids, One type is called binary acids and they consist of two elements: Hydrogen and any non-metal with the exception of oxygen, and oxyacids which consists of three or more elements: hydrogen and a polyatomic ion containing oxygen. Each has its own process for naming.

BINARY acids (Two elements-Hydrogen and any non-metal except oxygen)

Again when making a compound the positive ion (cation) and negative ion (anion) must equal zero. Remember these are molecular compounds. Hydrogen which is a +1 (and written first) will combine with non-metals of families 14, 15, 16 and 17 to form acids.

If hydrogen combines with sulfur then we have the compound H_2S, and when put into water solution we would call this hydrosulfuric acid. If H reacts with nitrogen we form H_3N, and if put into water solution we would have hydronitric acid.. Compounds have to have a neutral charge (pluses must equal minuses).

All binary acids always begin with the word *hydro*, and end with *ic*. The non-metal may or may not change its form. Sulfur stays sulfur (H_2S is hydrosulfuric acid) but nitrogen changes to nitr (H_3N is hydronitric acid). These take practice as does all of chemistry.

Try the following.

Write the formula for the following binary acids.

hydrochloric acid HCl

hydrophosphoric acid H_3P

hydroselenic acid H_2Se

hydroiodic acid HI

hydrofluoric acid HF

hydrocarbonic acid H_4C

hydroarsenic acid H_3A

hydrobromic acid HBr

Write the name of the following binary acids.

H_2Se hydroselenic acid

HCl hydrochloric acid

HF hydrofluoric acid

HI hydroiodic acid

H_3As hydroarsenic acid

H_3N hydronitric acid

Addition or Removal of H atoms from an Oxoanion

Remember an acid is a substance that has the ability to yield H^+ ions, therefore an oxoacid can loose or gain H atoms. These are the following rules for naming the oxoanions (charged oxoacid compounds). The chart above can also be used for the naming of oxoanions.

1. When all the H ions are removed from the "-ic" acid, the anions name is "-ate"
2. When all the H ions are removed from the "-ous" acid, the anions name is "-ite"
3. Name of anions in which one or more *but not all* of the H ions are removed, we must indicate the number of H ions still present by using the greek prefixes (omitting mono-)

H_3PO_4	phosphoric acid (the "-ic" form)
$H_2PO_4^-$	dihydrogen phosphate (lost 1 H ion, but not all)
HPO_4^{2-}	hydrogen phosphate (lost 2 H ions, but not all)
PO_4^{3-}	phosphate (lost all the H ions from the "-ic" form)

Try these....

Write the correct formula for these oxyacids.

chloric acid	$HClO_3$	phosphorous acid	H_3PO_3
iodic acid	HIO_3	carbonic acid	H_2CO_3
nitric acid	HNO_3	nitrous acid	HNO_2
perbromic acid	$HBrO_4$	hypochlorous acid	$HClO$
phosphoric acid	H_3PO_4	oxalic acid	$H_2C_2O_4$
chlorous acid	$HClO_2$	tartaric acid	$H_2C_4H_4O_6$

Write the name for these oxyacids.

$HClO_2$	chlorous acid	$HBrO_3$	bromic acid
H_3PO_3	phosphorous acid	$HClO_4$	perchloric acid
$HC_2H_3O_2$	acetic acid	HCN	cyanic acid
$HMnO_4$	permanganic acid	$HClO$	hypochlorous acid
$HClO_3$	chloric acid	H_2CrO_4	chromic acid

Again just because I can write the formula for or name an oxyacid does not mean that it exists. This is all there is to naming acids. You have to keep them straight and remember practice, practice, and more practice makes you good at doing this. We will use nomenclature all year long. You must remember it for the entire year.

Practice Balancing and Predicting:

1) potassium hydroxide + sulphuric acid → .....

$2KOH + H_2SO_4 \rightarrow K_2SO_4 + 2H_2O$

2) nitric acid + sodium oxide → .....

$2HNO_3 + Na_2O \rightarrow 2NaNO_3 + H_2O$

3) iron carbonate + nitric acid → .....

$FeCO_3 + HNO_3 \rightarrow Fe(NO_3)_2 + H_2CO_3$

4) hydrochloric acid + zinc → .....

$2HCl + Zn \rightarrow ZnCl_2 + H_2$

5) hydrochloric acid + barium hydroxide → .....

$2HCl + Ba(OH)_2 \rightarrow BaCl_2 + 2H_2O$

6) sulphuric acid + potassium hydrogencarbonate → .....

$H_2SO_4 + 2KHCO_3 \rightarrow 2H_2CO_3 + K_2SO_4$

7) iron + hydrochloric acid → .....

$Fe + 2HCl \rightarrow FeCl_2 + H_2$

8) nitric acid + lead oxide → .....

$2HNO_3 + PbO_2 \rightarrow Pb(NO_3)_2 + 2H_2O$

9) ..... → copper sulphate + water + carbon dioxide

$CuCO_3 + H_2SO_4 \rightarrow CuSO_4 + H_2O + CO_2$

10) ..... → hydrogen + zinc nitrate

$Zn + 2HNO_3 \rightarrow H_2 + Zn(NO_3)_2$

What solution will the following salts form; neutral, acidic, or basic:

1. NH_4Cl acidic — NH_4OH = weak base; HCl = strong acid
2. RbCl neutral — $Rb(OH)_2$ = SB; HCl = SA
3. BaF_2 basic — $Ba(OH)_2$ = SB; HF = WA
4. KCl neutral — KOH = SB; HCl = SA
5. $MgBr_2$ acidic — $Mg(OH)_2$ = WB; HBr = SA